

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
8 August 2002 (08.08.2002)

PCT

(10) International Publication Number
WO 02/061997 A2

- (51) International Patent Classification⁷: **H04L** (74) Agent: **SCHOENMAKER, Maarten**; Internationaal Octrooibureau B.V., Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).
- (21) International Application Number: **PCT/IB01/02702**
- (22) International Filing Date:
21 December 2001 (21.12.2001) (81) Designated States (*national*): CN, JP, KR.
- (25) Filing Language: English (84) Designated States (*regional*): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).
- (26) Publication Language: English
- (30) Priority Data:
01200319.0 30 January 2001 (30.01.2001) EP **Published:**
— without international search report and to be republished upon receipt of that report
- (71) Applicant: **KONINKLIJKE PHILIPS ELECTRONICS N.V.** [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL). *For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*
- (72) Inventor: **DAMSTRA, Nicolaas, J.**; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(54) Title: **WIRELESS TRANSMISSION SYSTEM**

(57) **Abstract:** The invention relates to a digital video and/or audio transmission system. To improve such a system the invention proposes to use for the compressing/decompressing the so-called DVCPRO standard (till the error correction) and use the so-called COFDM standard for the modulation/demodulation. The DVCPRO compression/decompression adds very little delay in the transmission chain and supplies a very reasonable video quality. Further the COFDM is very robust for multi path transmission and does not result in picture quality loss as long as the maximal bit error rate is taken care of. Further it was not obvious to use this combination because the DVCPRO standard is principle optimized for tape use.

WO 02/061997 A2

Wireless transmission system

The invention relates to a wireless transmission system for transmitting video and/or audio signals from a camera.

The invention further relates to a transmitter and a receiver for use in such a wireless transmission system.

5 The invention further relates to a method for transmitting video and/or audio signals from a camera.

From GB-A-2332124 a digital radio communication system is known having a mobile transmitter which transmits error protected digital data on a plurality of radio carriers to a plurality of receiving antennas. The receiving antennas are coupled to summation means to be combined to produce an output signal. The output signal is supplied to a multi carrier receiver to decode the original digital data.

10 This known digital radio communication system can only be used for radio transmission and can thus not be used for transmission of digital video.

15 It is inter alia an object of the invention to obtain a wireless transmission system for wireless digital transmission of video and/or audio signals. It will be realized that transmitting digital video signals has much higher requirements than transmitting radio signals as the prior art describes.

20 A first aspect of the invention provides a wireless transmitting system comprising the features of claim 1. A second aspect of the invention provides a method of transmitting video and/or audio signals comprising the features of claim 5.

25 The invention is based on the insight that by combining the so-called DVCPRO (digital video compression professional) standard for compressing/decompressing and by using the so-called COFDM (coded orthogonal frequency division multiplexing) standard for modulation/demodulation a very advantageous wireless transmitting system can be obtained.

Reference is made to the European Standard ETSI EN300744 and SM TE 307M-1998 Television Digital Recording (Tape Cassette).

5 The DVCPRO compression/decompression adds very little delay in the transmission chain and supplies a very reasonable video quality. Further the COFDM is very robust for multi path transmission and does not result in picture quality loss as long as the maximal bit error rate is taken care of. Further it was not obvious to use this combination because the DVCPRO standard is principle optimized for tape use.

Embodiments of the invention are defined in the dependent claims.

10 These and other aspects of the invention will be described hereinafter by way of example of the following description. Herein shows the Figure:

Block schematically a wireless transmission system according to the invention.

15 The Figure shows block schematically the wireless transmission system according to the invention. At inputs Iv and Ia the system WTS receives respectively a video signal and an audio signal. These two input signals are compressed using the so-called DVCPRO standard, whereby the compression is performed till the adding of error correction bits. The error correction bits are not performed according to the DVCPRO standard because
20 these error corrections are optimized for tape storage and not for wireless transmission.

This data stream which is available after compression is splitted whereby the blanks and overhead is removed. This results in real data and frame information. By deleting the blanks and overhead the data rate can be kept as low as possible.

The real data content is supplied to a re-arrange unit to re-arrange the data into
25 MPEG-structure. The MPEG packets are splitted into two streams and these two streams are supplied to a modulation unit for modulation according to the COFDM standard. After modulation the wireless transmission system comprises a RF part for making the signal ready for transmitting via antenna ANT1.

A receiver REC of the wireless transmission system also comprises an antenna
30 ANT2, which antenna receives the signal as transmitted by the transmitter TRA. In the receiver the signal is supplied to a demodulation unit comprising also a RF part.

The demodulation is also performed according to the COFDM standard. The resulting two streams are combined in combiner COMB to one stream of MPEG packets.

This stream is supplied to a separation unit SEP2 to take the real DVCPRO data, frame information and auxiliary data out of the MPEG structure. The separation unit is coupled to a regenerate unit REG to regenerate DVCPRO compressed stream from real data and frame information.

5 The regeneration unit is coupled to a decompress unit DECOMP to decompress the DVCPRO signal to obtain at outputs Ov and Oa respectively a video output and an audio output signal.

For example the MPEG transport stream structure has the following structure
47HEX (packet header)

10 Frame start indication (1 byte)
 Packet counter (1 byte)
 Number of DVCPRO data byte in this packet (1 byte)
 Number of auxiliary data bytes in this packet (1 byte)
 DVCPRO data bytes

15 Auxiliary data bytes
 Stuff bytes

The total number of bytes is in this example always 188.

Auxiliary data can for example be user's pacific control signals to control the camera and/or the other devices via the wireless transmission. The packet counter can be
20 used to split the MPEG packets in two streams of for example 14.4 megabit/seconds. By splitting these stream to choose options between the DVB-T standard to perform a robust transmission.

At the receiver's side both MPEG streams delivered by the DVB-T modulators are supplied in the right sequence and combined and subsequently the MPEG structure is
25 separated. This results in the availability of the real DVCPRO data content, (video plus audio), frame information to be used for synchronization and the auxiliary data.

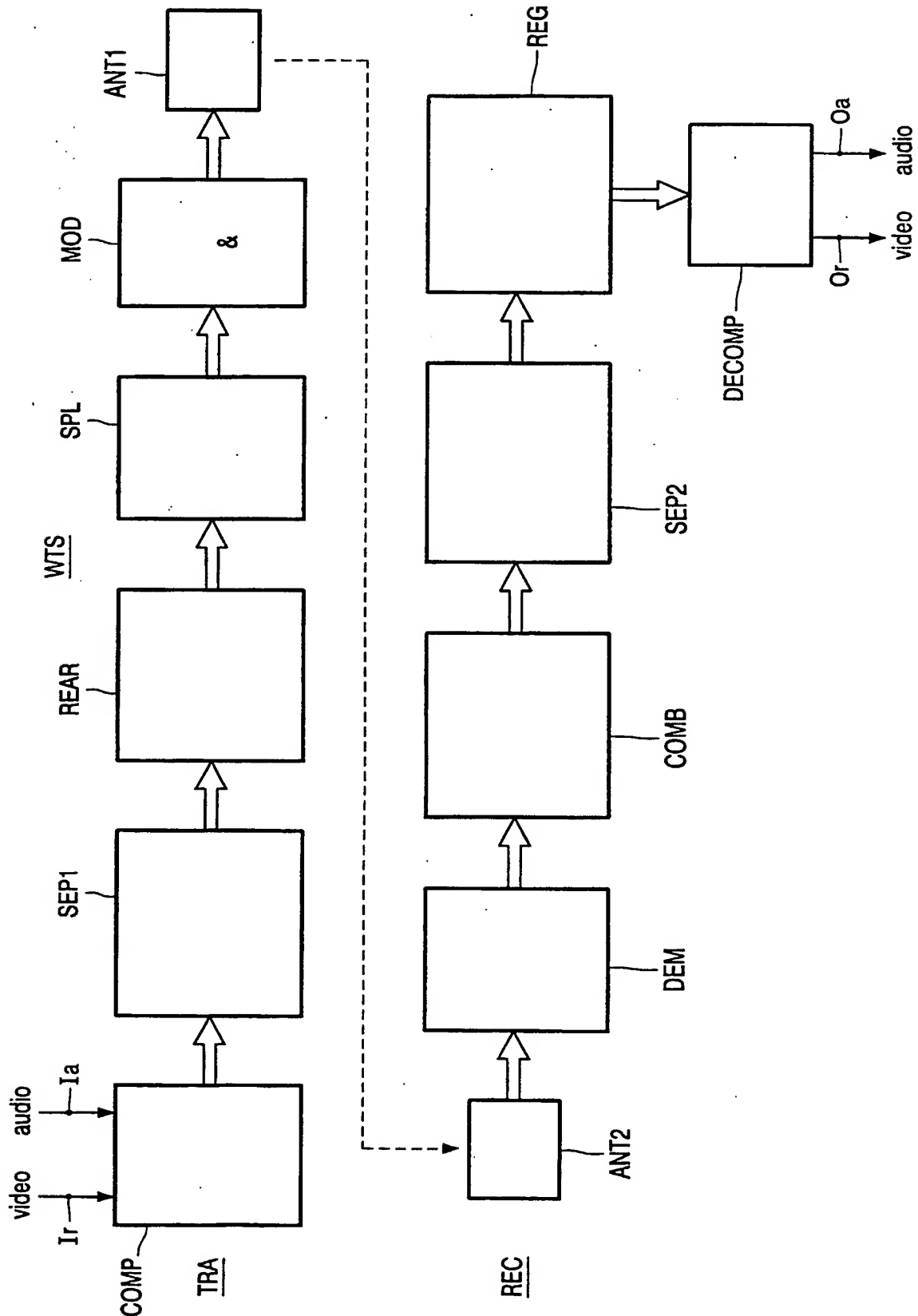
On the basis of the real DVCPRO data content and the frame information the DVCPRO decompressed signal is regenerated and supplied to the DVCPRO decompression whereafter the video and audio are available.

30 The man skilled in the art will be well aware of a lot of amendments falling within the scope of the invention. The main idea of the invention is to use the DVCPRO standard for the compressing/decompressing (till the error correction, which is in this standard specific for tape applications) and the COFDM standard for the modulation/demodulation.

CLAIMS:

1. Wireless transmission system for transmitting video and/or audio signals of at least one camera, comprising a transmitter with compression means for compressing the input signals, modulation means for modulation decompressed signals and an RF unit coupled to a first antenna, a receiver with a second antenna, a second RF unit, demodulation
5 means for demodulating the received signal, decompressing means for decompressing the demodulated signal, whereby the compressing/decompressing means used the DVCPRO standard and the modulation/demodulation means use the COFDM standard.
2. Wireless transmission system according to claim 1 characterized in that the
10 camera comprises the transmitter.
3. Transmitter for use in a wireless transmission system as claimed in claim 1.
4. Receiver for use in a wireless transmission system as claimed in claim 1.
15
5. Method for transmitting video and/or audio signals of a camera having a compression of the received signals, a modulation of the compressed signals, a sending of the modulated signals receiving the transmitted signal, demodulating the received signal, decompressing the demodulated signal whereby the
20 compressing/decompressing is performed according to the DVCPRO standard and the modulation/demodulation is performed according to the COFDM standard.

1/1



(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
8 August 2002 (08.08.2002)

PCT

(10) International Publication Number
WO 2002/061997 A3

(51) International Patent Classification:
5/44, H04L 27/26, H04N 9/804, 5/455

H04N 7/24,

(74) Agent: SCHOENMAKER, Maarten; Internationaal Octrooibureau B.V., Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

(21) International Application Number:

PCT/TB2001/002702

(81) Designated States (national): CN, JP, KR.

(22) International Filing Date:

21 December 2001 (21.12.2001)

(84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).

(25) Filing Language:

English

(26) Publication Language:

English

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(30) Priority Data:

01200319.0

30 January 2001 (30.01.2001)

EP

(71) Applicant: KONINKLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).

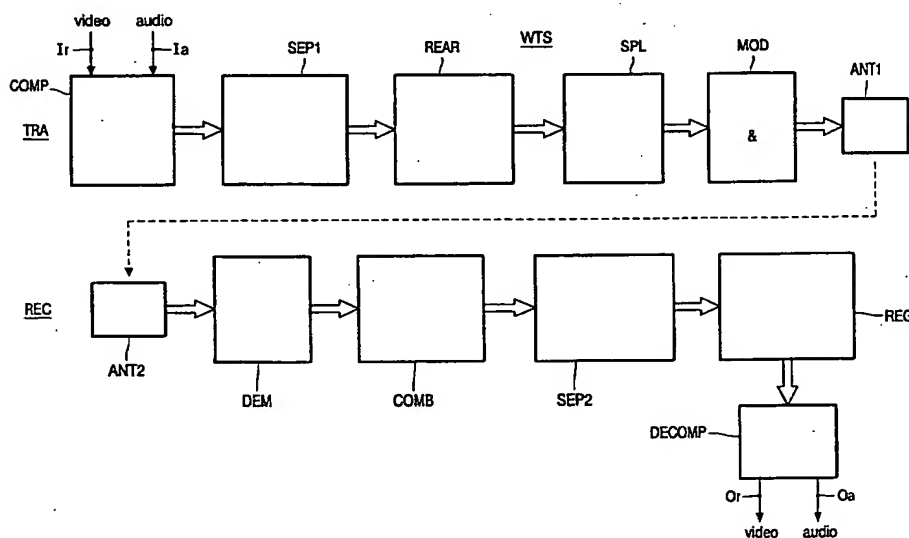
(88) Date of publication of the international search report:

12 February 2004

(72) Inventor: DAMSTRA, Nicolaas, J.; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: DVCPRO WIRELESS TRANSMISSION SYSTEM USING COFDM



(57) Abstract: A wireless digital video and/a audio transmission system is improved by using a DVCPRO compression/decompression scheme together with a COFDM modulation/demodulation. A disclosed example includes a wireless camera. The DVCPRO compression/decompression adds very little delay in the transmission chain and supplies a very reasonable video quality. The DVCPRO standard was introduced optimized and exploited only for recording on a tape. Here is exploited for video and/or audio compression before transmission. The standard is simplified and only the steps till the error correction are performed. Further the COFDM is very robust for multi path transmission and does not result in picture quality loss as long as the maximal bit error rate is taken care of.

WO 2002/061997 A3

INTERNATIONAL SEARCH REPORT

Internati Application No
PCT/IB 01/02702

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04N7/24 H04N5/44 H04L27/26 H04N9/804 H04N5/455

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04N H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC, COMPENDEX, IBM-TDB

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>HEDTKE R: "DATA REDUCED PRODUCTION TECHNOLOGY USING THE DVCPRO AND/OR MPEG-2 4:2:2 FORMAT"</p> <p>SMPTE JOURNAL, SMPTE INC. SCARSDALE, N.Y., US,</p> <p>vol. 109, no. 12,</p> <p>1 December 2000 (2000-12-01), pages 958-965, XP001001900</p> <p>ISSN: 0036-1682</p> <p>page 958, left-hand column, paragraph 1</p> <p>page 959, line 14 - line 21</p> <p>---</p> <p>-/--</p>	1-5

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

Date of the actual completion of the international search

17 November 2003

Date of mailing of the international search report

15/12/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Farese, L

INTERNATIONAL SEARCH REPORT

Internat Application No

PCT/IB 01/02702

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	NOBLES P ET AL: "High Bit Rate Data Transmission within Buildings for Wireless Digital Cameras" INTERNATIONAL BROADCASTING CONVENTION, LONDON, GB, 14 September 1995 (1995-09-14), pages 35-40, XP002160640 abstract	1-5
A	EP 0 823 794 A (FUJI TELEVISION NETWORK INC ;ADVANCED DIGITAL TELEVISION BR (JP)) 11 February 1998 (1998-02-11) page 9, line 5 - line 9 page 9, line 25 - line 29	
A	UCHIDA H ET AL: "DVCPR0: A COMPREHENSIVE FORMAT OVERVIEW" SMPTE JOURNAL, SMPTE INC. SCARSDALE, N.Y, US, vol. 105, no. 7, 1 July 1996 (1996-07-01), pages 406-418, XP000597144 ISSN: 0036-1682 page 418, middle column, paragraph 1	1,3-5
P,X	FLAHERTY, NICK: "Extra reflections on multipath link for wireless camera" EETIMESUK, 'Online! 19 September 2001 (2001-09-19), XP002261750 Retrieved from the Internet: <URL:http://www.eetuk.com/tech/news/OEG20010919S0003> 'retrieved on 2003-11-17! the whole document	1-5
L	RESEARCH AND DEVELOPMENT BBC: "The BBC Digital Radio Camera Project" R&D WHITE PAPER, 'Online! 1 February 2002 (2002-02-01), XP002261751 Retrieved from the Internet: <URL:http://www.bbc.co.uk/rd/pubs/whp/whp-pdf-files/WHP024.pdf> 'retrieved on 2003-11-17! Front date : February 2002. Copyright warning: 2001 page 8, last paragraph	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

Intern: — Application No

PCT/IB 01/02702

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
EP 0823794	A	11-02-1998	JP	2802254 B2	24-09-1998
			JP	9252291 A	22-09-1997
			EP	0823794 A1	11-02-1998
			WO	9725784 A1	17-07-1997
<hr/>					